

## **REMARKS**

Applicants note that in the accompanying RCE Transmittal, Applicants have requested that prosecution be suspended for a period of three (3) months. Applicants reserve the right to submit a supplemental amendment during that time period. Applicants having paid the appropriate fee, no Office Action should issue during said suspension period.

This Amendment, in connection with the following remarks, is submitted as being fully responsive to the Final Office Action. Claims 1 and 3-34 are pending in the present application. Claims 1, 3-19 and 25-32 have been amended to recite the claimed method as being performed via a program storage device read by a machine. No new matter has been added. Claims 1, 13, 20, 23, 25 and 33 are the independent claims. Favorable reconsideration is requested.

## **INTRODUCTION**

Claims 1 and 3-34 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 5,970,464 to Apte et al. ("Apte") in view of U.S. Patent No. 4,975,840 to DeTore et al. ("DeTore") and further in view of U.S. Patent No. 5,893,072 to Zizzamia ("Zizzamia"). Applicants respectfully traverse. Upon careful review of the cited art Applicants submit that although the cited art contains terminology that bears some linguistic and lexical similarity with the claimed invention, Applicants cannot stress enough the fact that a careful analysis of the (admittedly difficult) subject matter would disclose no semantic similarity with, and no teaching of, the claimed invention, whether alone or in any combination.

The prior art describes technology at least two generations prior to that of the claimed invention. Such older methodology is rule-based, where the rules are generated a priori by humans, and wholly in abstract of any other predictive variables. Rules are not

simultaneously and co-ordinatedly generated, as in modern systems which solve a large set of simultaneous conditions. The cited art thus simply does not teach or describe the highly granular, automatically generated individual policy scoring algorithm generated from a multivariate statistical model of the claimed invention, where the variables comprising and the model itself is automatically derived form the totality of the data as opposed to being “figured out” and then “modified” by “experts” or “underwriters.” Any similarity between the cited art and the claimed invention is superficial and lexical, and not substantive or semantic.

Applicants feel it necessary to stress that this application has now seen its third Examiner. Thus, no single Examiner has been with this case long enough to issue an office action and then remain involved to review Applicants’ subsequent response and react to it. That is highly disheartening. Moreover, Applicants believe, this state of affairs has caused unnecessary delays due to each respective examiner’s learning curve, which is then wasted as soon as he or she moves on. It has also created a copy and paste approach to office actions in this case, which Applicants do not see as providing them the full and legitimate examination to which they are entitled. Applicants thus respectfully request a careful review of this response (and not a cut and paste of rejections from earlier Office Actions), and an opportunity to hold a personal interview with the examiner and his supervisor to discuss any open issues once that is accomplished.

### **35 U.S.C. §112 REJECTIONS**

Claims 1, 3-19 and 25-32 were rejected under 35 U.S.C. §112. Applicants have accepted the Examiner’s suggestion, and have amended the preamble of each of independent claims 1, 13 and 25 to read “A program storage device readable by a machine . . .” Applicants

have similarly amended the preambles of dependent claims 3-12, 14-19 and 26-32 to respectively read “The program storage device of claim ... “ Accordingly, this rejection should be removed. Notice to that effect is earnestly solicited.

### **35 U.S.C. §103(a) REJECTIONS**

#### **The Claimed Invention**

Claim 1 is directed to a program storage device readable by a machine, the program storage device tangibly embodying a program of instructions executable by the machine to perform a method for predicting the profitability of an insurance policy.

The method comprises the steps of gathering policyholder data including premium and loss data for storing in a database and identifying external data sources directed to at least one of business level data and household demographics data. The external data sources are such as having a plurality of external variables that can be used in predicting the profitability of the insurance policy. The method further provides for associating the external variables with the policyholder data, evaluating the associated external variables against the policyholder data to identify the individual external variables predictive of the insurance policy's profitability, and creating a score based on an independently weighted multivariate statistical model based on the individual external predictive variables. The score is expressed as a sum of products, each of said products being a coefficient multiplied by a variable taken to a power. Further, such evaluation of external variables includes evaluating the utility of creating new variables from the external variables and creating any appropriate new variables, and the score is a function of at least all of the predictive external variables and any predictive new variables.

The remaining independent claims have similar features. Thus, all claims recite the obtaining and transforming of (i) real world data or (ii) data that represents (a) attributes of

real world persons (e.g., age, zip code, years in business, years of education, marital status, address) and their activities (e.g., type of business), or (b) real world places and objects and their attributes (e.g., weather patterns, crime rate, unemployment rate). The data is transformed into a score that indicates the profitability of an individual insurance policy. *Specification* at ¶ [0086].

A noteworthy feature of the method of claim 1 is the generation of a score based on the independently weighted statistical model based upon the individual external predictive variables and any predictive new variables. Moreover, the score is expressed as a sum of products, each of said products being a coefficient multiplied by a variable taken to a power (the described y-intercept would be a variable taken to a power of 0, and thus be unity). As described in the specification, although external data sources offer one of the best opportunities to obtain the characteristics of a business and/or the practices of an owner of the business property to be insured, commercial insurance companies' use of such data to supplement their conventional pricing methods has been at best haphazard, inconsistent, and non-systematic. *Specification* at ¶ [0009].

According to a described exemplary embodiment, after collection, such external data can, for example, be culled to eliminate highly repetitive predictor variables (*i.e.*, create a more or less orthogonal variable set), and the remaining variables can, for example, be included in an automatically generated multivariate statistical model. *Specification* at ¶¶ [0083-0089]. Additionally, new variables can be created from the external data. Such new variables are combinations of or derived from external variables obtained from the external data sources, and these "synthetic" variables can be included in the variable set from which the statistical model is generated. Once the predictive variables are obtained (*i.e.*, both external variables and created or derived new "synthetic" variables), *each predictor variable can, for example, be assigned a*

*separate co-efficient.* *Id.* at ¶¶ 86-87. Thus, the present invention is a data driven approach, obtained by mining the data as a whole, where (i) identification of external predictor variables and predictive new variables, and (ii) the weights to be assigned them, are automatically generated from a statistical analysis operating on large amounts of historical data obtained from a variety of sources, as described above. *Id.* at ¶¶ 70-89. The statistical analysis automatically determines the optimal weighting of such predictor variables:

The development process of the predictive statistical model generates the mathematical formula's coefficients. One example of the form of such a simplified equation might be as follows:  $a_0 + a_1x_1 + a_2x_2 + \dots + a_Nx_N = y$ . In this example, the "a's" are the coefficients, the "x's" are the individual predictor variables, and "y" is the score, i.e., the indication of commercial insurance profitability. The "a0" is the mathematical "y-intercept".

*Id.* at ¶ 86.

#### **Rejections Based On Teachings of Apte**

In the Office Action, at page 4, items 5(A)(v) and (vii), Apte is cited at its Abstract, 3:44-53, 6:44-7:17, and Figs. 1-14 as teaching:

“v. creating a score based on an individually weighted multivariate statistical model based on said individual external predictive variables, wherein said evaluating external variables includes evaluating the utility of creating new variables from the external variables and creating any appropriate new variables.”

and

“vii. wherein said score is a function of at least all of the predictive external variables and any predictive new variables.”

Final Office Action at 4.

Applicants respectfully, but most vehemently, traverse. In none of these passages does Apte teach or even suggest an independently weighted multivariate statistical model or a

score based thereon, where said score is a function of at least all of the predictive external variables and any predictive new variables, and where such score is expressed as a sum of products, each of said products being a coefficient multiplied by a variable taken to a power.

Let's look at the cited sections of Apte and see if they actually teach what the Office Action alleges:

Apte at Abstract (emphasis supplied):

A computer implemented method of underwriting profitability analysis delivers the analytic process to a wide cross section of insurance decision makers. The underwriting profitability analysis system leverages an existing investment in databases and improves underwriting business processes. Data mining techniques are applied to historical policy and claims **to extract rules that describe policy holders with homogeneous claim frequency and severity characteristics**. These rule sets are used to classify policy holders into distinct risk groups, each with its own set of characteristics, including pure premium. **Breaking up a book of business into segments allows identification of sub-populations of policy holders that distinctly deviate from the expected normal pure premium**. This identification allow the insurance business analysts to interactively adjust eligibility criteria and examine altered characteristics of the covered segments until satisfactory. The system is implemented on a client server using network centric language technology.

Apte at 3:44-53:

An insurance company's historical policy and claims data typically resides on enterprise level databases, in transaction format, typically on a quarterly basis. Several quarters worth of data, usually sixteen quarters or more, is first extracted, for a given business region of interest, such as a state. Since policy and claims data usually reside separately, the extracts are first joined so that records are available, per quarter, on a joint policy-claim basis. From this data, which usually will be in the order of a few gigabytes, a statistically valid sample is extracted for the data mining run.

Apte at 6:44-7:17 (emphasis supplied):

### Model Viewer

When the Viewer tab is selected, the viewer screen shown in FIG. 8 is displayed. This screen allows a user to see in further detail particulars about a model or an edited **rule set** that has been selected from the **existing models** screen. In addition to identifying the database name on which the model was trained or evaluated, this screen also displays the accuracy estimate of the model in terms of several statistics. Also, **the rules that comprise this model** will be available for inspection in this screen. One individual rule will be displayed at a time, but a scroll facility allows **the entire rule set** to be scrolled through for a rule. The screen will display the actual rule in "If-Then" English-like notation. The individual rule statistics will also be displayed, including a predictor value and a confidence interval, and the coverage of the rule for the database.

The flow diagram from the viewer client/server process is shown in FIG. 9. In function block 901, rule sets' summary statistics are displayed. This is done by accessing local rule sets from local store 902 and rule sets from the server store 903. The user is given three choices in selection block 904. The user can **select a rule set for editing** in selection block 905, **select to test a rule set** in selection block 906, or **select to re-calibrate a rule set** in selection block 907. If the user selects a rule set for editing, the editor is invoked, as described in more detail below. If the user selects to test a rule set, then a call is made to the server to test the selected rule set to a selected data set in function block 907. This is done by accessing data from the client local store 902, from the server store 903, from the meta-data store 908, and from the data store 909. The result of the test is returned to the client process which displays the data in function block 901. If the user selects to re-calibrate a rule set, a call is made to the server process which calibrates the selected rule set against a selected data set in function block 910. Again, this is done by accessing data from the client local store 902, from the server store 903, from the meta-data store 908, and from the data store 909. The result of the test is returned to the client process which displays the data in function block 901.

As shown in each of the cited sections of Apte from the Office Action, Apte is a rule based system. It does not teach -- in any of these cited sections -- either:

v. creating a score based on an individually weighted multivariate statistical model based on said individual external predictive variables, wherein said evaluating external variables includes evaluating the utility of creating new variables from the external variables and creating any appropriate new variables; or

vii. wherein said score is a function of at least all of the predictive external variables and any predictive new variables obtaining an individual score for a given insurance policy utilizing a weighted contribution from a set of predictive variables.

Apte has *no* creation of new variables in any of these citations. It has *no* individual score for an insurance policy in any of these citations. It has *no* score that is a function of all the predictive variables and any new predictive variables in any of these citations. It has no score that is a function of a series of variables and weights, where the weights are simultaneously determined by considering the entire system as a whole using an optimal or converged solution of a multivariate statistical model. Thus, the rejection set forth in the Final Office Action fails!

Apte does not generate new variables from external data, or determine if that is appropriate. It has no “model” other than a set of rules, as shown above. A set of rules is not a scoring formula. A set of rules does not assign a separate and unique score to each individual insurance policy based on that insured’s values for each of the predictive variables. A set of rules can be used to generate predictions about an insurance policy, but that is not A set of rules allows like policies to be lumped together in segments, as Apte explicitly states in its Abstract: **“Breaking up a book of business into segments allows identification of sub-populations of policy holders that distinctly deviate from the expected normal pure premium.”** A segment

lumps together multiple policies under one premium – it does not calculate an individual premium based on an individual score for each policy.

In fact, all Apte has are rules. Fig. 8 of Apte shows in detail “Rule 4.” Rules, such as Rule 4 of Fig. 8 of Apte, are not a score that is a weighted multivariate expression of all the predictive variables being used. The rules in Apte are used to perform a scenario analysis that displays an output shown in Fig. 13 of Apte. All Apte has to say about this output is the following:

Once specified, and the "Analyze" button selected from the "File" pull down menu, the system will perform a scenario analysis, and display to the user, in a subsequent screen, a detailed segmentation report.

Apte at 8:67 – 9:3.

Again, looking at Fig. 13 of Apte, one does not see any score at all. One sees only a set of rules, their percentage of coverage of the scenario, and various conclusions from applying the various rules to the scenario. One does not see generation of a score from an individually weighted multivariate statistical model, or any mention that said score be a function of at least all of the predictive external variables and any predictive new variables.

Now Applicants have pointed out these lacunae of Apte repeatedly. Applicants do not mind if the Examiner disagrees with their position, but this has never been demonstrated or expressed other than conclusorily at the end of a lengthy office action, almost as an afterthought. All the Office Actions do (including the Final Office Action) is repeat the claim element, and assert that Apte teaches it. But Apte *cannot*, as it is an old fashioned rule based system. Rules are not generated simultaneously, considering the effect of all other variables on

the predictability of each one. Rules are generated one at a time, precisely as described in Apte. They are generated by humans doing research or by human experts. Precisely as in Apte.

In contrast, a multivariate statistical model is generated automatically by the claimed machine, by repeatedly matching various weightings of a set of input variables to certain outputs (including automatically generated synthetic variables), to find a predictive expression of the form  $y = a_0 + a_1x_1 + a_2x_2 + \dots + a_Nx_N$ , *i.e.*, a sum of products, each of said products being a coefficient multiplied by a variable taken to a power. Precisely as in the claimed invention. It is key to appreciate that in the claimed invention the data as a whole, operating together, solving for the most accurate variables and weights associated with those variables for all of the variables simultaneously – creates the statistical model. Not humans creating a set of rules one at a time from various statistical data as in Apte. The difference is vast, and significant.

### **Neither DeTore Nor Zizzammia Cure The Defects Or Lacunae of Apte**

DeTore does not cure the defects of Apte. DeTore is directed to a 1980s vintage artificial intelligence (“AI”) system, of the expert system type. As such, it seeks to use the accumulated knowledge of experts to evaluate the risk of a proposed insurance policy and thus make underwriting decisions. “Underwriting knowledge base 24 is the information base that drives the system.” DeTore at 4:54-55. The knowledge base incorporates the information contained in the underwriting manuals used by the assignee of DeTore (*i.e.*, Lincoln National Risk Management, Inc.) , as well as factual elements and programmed knowledge in the form of expert modules. *Id.* at 4:55-5:3. DeTore is designed to allow non-expert underwriters to underwrite potential insurance business. They do this by accessing the expert system.

In similar fashion to Apte, DeTore describes a qualitative, rule driven approach, which uses various rules to match identified “problems” from the application data base to a corresponding “impairment” from the underwriting database, and then assigns weights (debits or credits) to the identified problems based upon information (*i.e.*, other rules) in the underwriting database. A problem is not an external datum or even related to external data! A problem is defined by DeTore as follows:

For purposes of this discussion, the term "problem" will generally mean an element of information (e.g., facts and conditions such as age, a medical condition, a hazardous avocation, a smoking or drinking habit, etc.) stored in application data base 20 which impacts either positively or negatively upon the relative mortality of the proposed insured. The term "impairment" will generally mean an element of information (e.g., the impacts of aging, various medical conditions, avocations, smoking, drinking, etc. on the mortality of known populations) stored in underwriting knowledge base 24 which relates to or corresponds with the information contained in application data base 20. Each impairment is associated with textual information and/or an expert system or module which is intended to assist the system operator in quantifying the impact of a particular problem (by reference to a corresponding impairment) upon expected mortality in a particular instance.

DeTore at 5:40-57.

Once the weights have been *assigned* to the identified problems (again, not any external data, and again “assigned” not evolved or developed using a multivariate model), they are then combined to generate a risk classification for the proposed insurance. DeTore at 5:40 – 6:2. This assignment of weights is not by a machine running some multivariate statistical analysis algorithm to find the best weighting for a set of variables, as in the claimed invention. Quite the contrary. In DeTore, any contribution from a “problem” is determined *a priori*, by an expert module. If there is no expert module available for a given “problem” the problem is normally left “unresolved” unless the underwriter (now an actual human) is himself an “expert” in the subject area of concern. *Id.* at 15:20-34. *At no time is external data mined to identify*

*predictor variables and then further processed to assign weights consistent with the data given a statistical analysis. At no time are new variables created from external variables, or is the utility of such creation evaluated.* All DeTore teaches is assigning weights to internal problems – information stored in the application database, i.e., provided by an applicant for insurance -- *a priori*, using expert modules or, where no expert module is available, using a human expert acting “on the fly.” *Id.*

The Final Office Action cites conclusorily that DeTore teaches “evaluating the associated external variables against the policyholder data to identify the individual external variables predictive of the insurance policy’s profitability.” Office Action at 5, the ¶ labeled as “(1).” Respectfully, this is simply untrue, and Applicants once again traverse.

DeTore does not use external data at all! DeTore does not teach automatic creation of a multivariate statistical model, or teach generating a score based thereon. DeTore wholly ignores the issue of creating new variables from external data sources, *i.e.*, “synthetic” variable creation. Creation of a synthetic variable is not “adjusting one or more of the weights assigned to selected problems on the basis of previously stored statistical profiles relating to the selected problems.” (DeTore at 15:43-46) as cited by the Final Office Action at 14.

Creation of a synthetic or new variable is exactly what it says. For example, the data found in insurance policy databases contains the home residence of the insured as well as the name of the brokerage through which the insurance policy was sold

The cited section of DeTore has nothing to do with synthetic variables. It simply is adjusting the weights

Again, Applicants do not mind if the Examiner disagrees with their position.

However, to back up such a demurrer, Applicants respectfully request a detailed showing of how DeTore in fact teaches the claimed feature. This has not been done.

Thus, DeTore is not seen by Applicants as curing the deficiencies of Apte as a reference against claim 1, and the combination of references used in the Office Action to teach elements (iv), (v) and (vii) of claim 1 (as set forth above) fails, and is thus once again traversed.

Applicants respectfully assert that Apte and DeTore, even when combined, do not teach all of the recited features of the independent claims, to wit: operating upon external data to evaluating the utility of creating new variables from the external variables and creating any appropriate new variables, or creation of a statistical model from all predictive variables utilizing a multivariate statistical approach.

Any combination of these references with Zizzamia also fails. Zizzamia is directed to predicting accurate loss ratios for personal lines insurance products, not to predictively scoring commercial policies of insurance as to profitability. Zizzamia does not cure the deficiencies of Apte or DeTore as a reference against the claimed invention. Zizzamia's sole reference to a multivariate statistical model is the following:

The predictor 32 must produce a predicted loss ratio given a set of classification plan variable values. Multivariate statistical modeling curve fitting techniques provide a method for creating such a predictor. Curve fitting techniques generate a correspondence between prescribed sets of inputs and outputs. One such technique is multiple regression, described in "Intermediate Business Statistics: Analysis of Variance, Regression and Time Series" by Robert Miller and Dean Wichern, incorporated herein by reference.

However, in the preferred embodiment, the loss control system 8 employs neural network modeling algorithms executed on computational hardware to generate signals indicative of the predictive apparatus 12. A neural network is a

nonlinear general purpose function approximator which is trained to learn an unknown function based on known inputs and corresponding outputs. Once the neural network learns the unknown function, the neural network is able to generate outputs for other sets of inputs, even input patterns to which the network was never exposed. Neural network topologies and training techniques, specifically those used in the preferred embodiment as disclosed hereinafter, are described in "Neural Networks: A Comprehensive Foundation" by Simon Haykin, also incorporated herein by reference.

Zizzamia at 9:18-42.

Zizzamia obviously advises against using multivariate statistical modeling curve fitting techniques, and endorses the use of neural networks. Because Zizzamia is directed to personal lines insurance products, which require that an insurer list all of the underwriting factors it uses, Zizzamia does not, and could not, teach a machine that automatically evaluates the utility of creating new variables from the external variables and creates any appropriate new variables as a result of that evaluation. It is simply impossible, given the regulatory regimes of government insurance overseers, to add any data driven predictive variables after a given insurer's set of factors has been filed with a state regulatory agency. Moreover, Zizzamia does not describe generation of any score from an individually weighted multivariate statistical model, and also fails to describe that said score be a function of at least all of the predictive external variables and any predictive new variables. Finally, Zizzamia fails to describe a score expressed as a sum of products, each of said products being a coefficient multiplied by a variable taken to a power.

In contrast, the claimed invention, inasmuch as it is applicable to commercial lines, involves a gamut of variables that are neither disclosed nor included on any insurance regulatory rating classification plans on file with State Insurance Departments. The reference to the use of a multivariate statistical model in Zizzamia is limited to the adjustment of the absolute

value of already disclosed factors in such regulatory rating classification plans for the sole and expressed purpose of optimizing such disclosed factors' values.

Applicants have raised this distinction on the record. The Final Office Action, as in prior Office Actions, glides over Applicants' prior arguments in this regard. One cannot simply assert that a rule based system such as is described in Apte – which, Applicants have analyzed and demonstrated at length, can be combined with an expert based (also human, also a priori) system such as DeTore, to teach all of the elements of the claimed invention. The claimed invention recites automatically data mining the variables to find a multivariate statistical model, not a human or humans creating set of rules independently from each other!

The claimed automatically generated statistical model does not comprise adding together a set of separately generated rules into a single expression. The claimed automatically generated statistical model is generated by automatically using various trial weightings of all of the variables, including any synthetic variables automatically generated (unlike, and impossible, in Zizzamia), to find an optimal predictive weighting. The contribution of each variable in combination with all other variables is always considered.

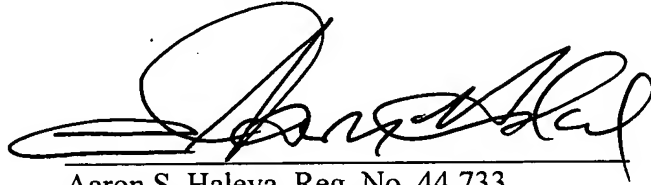
For at least these reasons, amended claim 1 is asserted as patentably distinguished over Apte, DeTore and Zizzamia, whether taken alone or in any combination.

The remaining independent claims, claims 13, 20, 23, 25 and 33, recite similar features as does claim 1, and are thus also urged as patentable over Apte, DeTore and Zizzamia, whether alone or in any combination, for similar reasons. The dependent claims are thus also urged as patentable for similar reasons.

No additional fees are believed due herewith. If any additional fees are due, the Commissioner is hereby authorized to charge any fee deemed necessary for the entry of this Amendment to Deposit Account No. 50-0540.

Dated: April 22, 2010.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'Aaron S. Haleva', written over a horizontal line.

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